REPORT

Of

WESTERN PINE BEETLE SURVEY

On The Proposed

HAPPY CAMP - LAVA BED PINE BEETLE CONTROL PROJECT

MODOC NATIONAL FOREST,

CALIFORNIA.

U.S.Bureau of Entomology

Forest Insect Field Station

Klamath Falls,Ore.

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REPORT OF SURVEY

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HAPPY CAMP - LAVA BED PROJECT

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Map of Area

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HAPPY CAMP LAVA BED PROJECT

Modoc National Forest, California

HISTORY

The first report of insect infestation on the Happy Camp Lava Bed District of the Modoc National Forest, California was received in May 1922 when some of the control men from Southern Oregon-Northern California Pine Beetle Control Project visited the ice caves on this territory.

Because of the valuable timber resources in this region, largely owned by a few private companies, Mr. J.F.Kimball requested the Forest Service to detail Mr. A.J.Jacnicke to make a preliminary examination of the area.

A report of this examination was made by Mr. Jacnicke in December 1922. In general he reported that an epidemic infestation existed over considerable portion of an area of 430,000 acres in this region, and that during the last three years a loss of 100,000,000 board feet had been caused by the Western Pine Beetle. He recommended that a more detailed survey be made by the Bureau of Entomology to determine if control work should be undertaken.

Following the recommendations made by Mr. Jacnicke the Forest Service allotted $700 for the survey work. The Pickering Land and Timber Company contributed $100 and the Red River Lumber Company contributed $200 towards the work.

The survey was started on ~~September~~ August 20, 1923 and was carried out under the direction of the writer, by Mr. H.A. Wise and Mr. Harvey Abbey, of the Klamath Falls station of the Bureau of Entomology.

METHODS of the SURVEY

The methods of extensive reconnaissance developed by the Bureau were used in determining the extent and status of the infestation.

A number of sample sections were cruised throughout the area and all of the trees killed by beetles during 1921 and 1922 were blazed, numbered and mapped. Strips, ten chains wide were run through the rest of the area and the number of trees per mile counted. With the sample cruise sections and the sample strips as a basis, the estimates of the number of trees killed per year per section were made.

In this survey 360 miles of strips were run and 10 half sections covered with intensive cruising. Thus the insect killed trees were actually counted on 32,000 acres, which represents an 8% cruise of the area.

The total cost of the survey was $414.21 or a cost of $.001 per acre.

Timber Acreage and Resources Involved

No accurate estimate of the volume of the pine stand is available. It is roughly estimated that there are five billion feet of yellow pine on the area, of which about 1,600,000,000 board feet are Federally owned and 3,400,000,000 board feet privately owned.

As pointed out by Mr. Jaenicke "the stands fall into two rather distinct classes from the standpoint of volume and quality. One, of about 230,000 acres contains from 2 to ten M. board feet per acre with an average volume of perhaps 7 M. board feet per acre, or a total stand of somewhat more than 1,600,000,000 M. board feet. This timber is rather short and stubby and of but fair "merchantability". For the most part this stand is owned by the federal government.

" The second class of yellow pine lands has an area of 200,000 acres and is conservatively estimated to run from 11 to 35 M board feet per acre, or a total of 3,400,000 M board feet. This second class of lands contains clean-boled pine, of highly "merchantable" timber and is for the most part in private ownership.

Of the total area of 432,640 acres, 177,120 acres, or 41% are within the Modoc National Forest and 255,520 acres, or 59% are privately owned. Table 1 gives the distribution of this acreage by units and by ownership. Of the privately owned land 77% is divided between two owners, the Pickering Land and Timber Company and the Red River Lumber Company.

PRESENT INSECT LOSSES

The timber losses on the area are being caused by two well known destructive pine beetles found in this region i.e., the Western Pine Beetle (Dendroctonus brevicomis Lec) and the Mountain Pine Beetle (Dendroctonus monticolae Hopk). Both of these beetles have caused untold destruction of western pines in the past, yet have been successfully controlled where the timber values have warranted the application of control measures.

Mr. Jaenicke's first report of the annual losses on this area is confirmed by the present survey which shows that in the past year 38,000 trees were killed on the area of 432,000 acres, or a total loss of 37,381,000 feet B.M. which, if valued at $3.00 per M.B.M represents a monetary loss of $112,143 in one years time.

The division of this loss is given by units and ownership in Tables II and III.

The check cruising of the sample sections indicates that over a large part of the area the infestation has remained about constant for the past few years. In a number of units the infestation has not been above normal for a number of years while other units show epidemic infestation which has lasted for several years, and can not be expected to materially decline through natural agencies.

In the heaviest epidemic centers, a natural decline can be expected. The history of all severe epidemic centers has shown that they may be expected to decrease rather suddenly through the effect of natural agencies, but that complete control will not be reached for a number of years without the application of artificial means.

Division of the Area into "Units"

Although the Happy Camp area is very uniform as to topography it is far from uniform as to timber type, or intensity of infestation. For this reason it is possible to break the area up into "Units" where conditions are more or less uniform, and which from the standpoint of control can be considered independantly from the others.

As a rule the units carrying a poor stand of timber carry a low infestation, while for the most part the heavier infestation is found in the better stands of yellow pine bordering upon the mixed fir type.

The units as shown by the attached map have been laid out with the idea of including within each unit areas with uniform conditions and at the same time extensive enough so that control can be undertaken on any one unit without reference to the others.

A brief summary of conditions on the various units is as follows:-

1 Glass Mountain Unit

Topography: practically level on the eastern portion, steep and mountainous on the northern edge. Some very fine yellow pine timber averaging about 1000 board feet per infested tree. Eighty percent of area in private ownership. Heavy epidemic infestation averaging 96 trees per section per year. No evidence of decline apparent. Control recommended.

2 Timber Mountain Unit

This unit embraces the timbered area between the Glass Mountain and Badger Units which lies over the lava formation. Ninety-two percent of the area is federally owned and within the Modoc National Forest. The topography is level and the stand of timber poor. Since it carries a low epidemic infestation with less than 20 trees per section annual loss, no control work is recommended.

3 Badger Unit

Almost level throughout the entire unit. Fair quality of yellow pine with some scattered timber. Infested trees will average about 900 board feet. The National Forest controls one entire township within the unit and this is the only place where it would be possible for the Forest Service to undertake control independantly of cooperation with the private owners. The infestation might be termed a moderate, balanced epidemic, averaging an annual loss of 54 trees per section. Control work is recommended.

4 Lava Unit

This unit embraces the territory lying over the lava flows to the southwest of the Timber Mountain Unit and contiguous with it. The same conditions prevail as on the Timber Mountain Unit, except the infestation will average slightly more per section. However, because of the poor character of the timber and the low infestation no control work is recommended.

5 Happy Camp Unit

This unit embraces 68,080 acres of fairly high quality yellow pine lying in the middle of the project area. Sixty-seven percent is owned by the Red River Lumber Company. The topography is gently rolling to fairly level with a number of large rock flat openings. The infestation represents a moderately high epidemic condition averaging an annual loss of 60 trees per section. This infestation could be reduced through control work, therefore it is recommended.

6 Pitt River Unit

This unit covers 45,360 acres of forest land broken by large rock flats and scattered stands of pine. Seventy percent is controlled by the Forest Service. The stand of timber is of fair quality, averaging about 900 board feet per tree.

On one portion of the unit an epidemic infestation was found which shows signs of increasing and spreading. Control work is recommended to stop this increase.

7 White Horse Unit

This unit embraces 32,000 acres of very high quality pine averaging 1200 board feet to the infested tree. Eighty-three percent is owned by the Red River Lumber Company. The infestation can be classed as a moderately high epidemic, averaging an annual loss of about 52 trees per section. Because of the high timber values at stake, control work is recommended.

8 Widow Valley Unit

The Widow Valley unit joins the White Horse unit on the north slope of the Big Valley Mountains. It carries a stand of high quality pine 95% of which is in private ownership. However, the present infestation must be classed as endemic or "normal" and there is no need of applying artificial control.

9 Hot Springs Unit

This unit takes in the rather steep southern expanse of the Big Valley Mountains carrying a scattered stand of poor quality timber. As is often the case on these warm southern exposures the beetle damage is particularly severe, averaging an annual loss of 41 trees per section, per year.

Control work is recommended for this unit, but because of the very mixed ownership and large number of small owners involved control work will not be practical without resorting to the forming of a "Zone of infestation" under the new State law, and it will take considerable organizing to secure the applications of 60% of the owners in this unit in favor of establishing such a "Zone"; for this reason, and because of the average poor quality of the timber involved, artificial control may be of doubtful expediency.

10 Buck Valley Unit

This embraces an area of 17,600 acres of timber land entirely privately owned. The timber is of fair quality with considerable areas of scattered stands. The infestation can not be considered as above normal and hence no control work is recommended.

In Tables IV and V these units have been listed as to whether control work is recommended or not.

Treatment Required

The method of pine beetle control consists in locating the infested tree, containing the live beetle broods; felling the tree; peeling the bark from the upper portion and burning all of the infested bark. This work is best conducted during the spring and fall when the overwintering generation of beetles are to be found in the trees.

In order to secure the best results it is necessary to treat about 50% of the total years loss during the period October 1 to June1st. Table VII gives the estimated treatment required during the fiscal year 1925. On this basis and using the average cost figure of $4.50 per M.B.M. (which was the average figure on the Southern Oregon-Northern California Pine Beetle Control Project for the first year's work) the total cost on these units recommended for treatment would be approximately $70,000. The division of this cost by units and ownership is given in Table VIII.

It can be anticipated that control work will reduce the infestation 50% following the first years work and that with some additional work a further reduction of 50% can be expected, or a total reduction of 75% in two years. Thus it will be seen that control work will easily pay for itself in timber saved within two years and may possibly pay for itself in one year as has occured on the Southern Oregon-Northern California Project.

Control Considerations

In considering the advisibility of applying artificial control to any given area it is the function of the entomologist to advise as to what may be expected from the work and the duty of the owner to decide whether the timber values at stake will warrant the cost of protection.

It has been the experience on practically all of the control projects, so far conducted, that a reduction of 50% in the losses can be expected following the first year's work and that further work will reduce the infestation to 25% of its original intensity.

A recent successful demonstration of the possibility of controlling these timber pests, is the Southern Oregon-Northern California Pine Beetle Control Project, where the Federal government and the private owners have combined forces to combat the beetles over an area of a million and a quarter acres: The results of this work have been most encouraging and have shown sufficient reduction in timber losses within the first year to more than cover the cost of the control work.

As shown by the survey, certain portions of the Happy Camp Area are suffering from heavy insect losses. These losses vary considerably in various portions of the area so that it has been divided into "Units" embracing areas of more or less uniform conditions.

In six units control work is recommended from an entomological standpoint as being feasible and offering the possibility of reducing the yearly losses with a profit to the owners. In four units only a normal endemic infestation exists and control work at this time will not improve the situation.

Between the heavy infestation in the Glass Mountain unit and the Antelope Project, which the Weed Lumber Company has successfully carried out in adjacent territory, there is a ten mile strip of timber very free from beetle infestation. It is doubtful if the Antelope Project is in any danger of becoming reinfested by the migration of the beetles from this heavy center for several years at least. It seems to be the tendency of epidemic centers of infestation to move rather slowly where there is a large timbered area available for the beetles to carry on their work.

The entire area recommended for control work could be cleaned up in one year with five twenty-man camps working full time during the spring and fall control periods, of about 50 working days each. The greatest difficulty will be in securing camp locations where water is available. However, this difficulty will be partially offset by the ease with which various parts of the area can be reached by trucks. It will be possible to establish camps near a water supply and transport the men to work for considerable distances by means of auto trucks.

In order to make the control work practical, cooperative relations between the Federal government and the private owners should be established. Without such cooperation, control work over the entire area of any unit is impractical and could not be effectively carried out. Actual control work could be divided between the cooperators so that each would take care of the units in which they hold the largest interests. On this basis the Forest Service would handle the work on two units and the private owners on four units.

On the basis of these various considerations, it is the problem of the timber owners, Federal and private, to decide to what extent they desire to protect their timber from beetle depredations. From past experience, it is certain that the effort and expense involved will be fully justified.

A Protection Plan

In case the owners decide in favor of protecting their timber from the beetle menance, control work should be undertaken only under a permanent plan of protection involving:-

1. Original control work as outlined in this report to reduce the infestation to a normal status throughout the area at a cost of approximately $70,000.

2. An annual detection survey which will determine the status of the infestation and whether further control work on any part of the area is advisable. Such survey should not cost in excess of two mills per acre.

3. Subsequent control work only when needed, as determined by the annual survey, to prevent any area from again becoming epidemic. Such extra work might be needed for a number of years and in any case should not exceed a cost of three cents per acre per year.

In order to carry out such a protection plan, cooperative agreements should be made between the Forest Service and the private timber owners for the carrying out of the actual control work and for equitable distribution of the costs; and with the Bureau of Entomology for technical advice and assistance.

Experience in the past has shown that without such a protection plan, control work is apt to be inefficient and ineffective; and without continued watchfullness the benefits of the original control work are apt to be of short duration.

TABLE I

Timbered Acreage By Ownership

Unit	Modoc National Forest Acres	Red River Lbr.Co. (T.B.Walker) Acres	Pickering Land & Timber Co. Acres	Other Private Owners Acres	Total Acres
Badger	41,400	5,200	30,160	8,400	85,200
Pitt River	32,560	2,620	6,000	4,180	45,360
Happy Camp	15,360	46,080	3,720	3,720	68,880
Timber Mt.	29,160	840	440	1,360	31,800
Glass Mtn.	9,200	20,920	23,120	2,080	55,320
Lava	37,120	2,480	0	80	39,680
White Horse	3,440	26,560	0	1,880	32,000
Widow Valley	1,920	22,120	0	10,920	34,960
Hot Springs	6,960	4,880	0	10,000	21,840
Knok Valley	0	1,800	0	15,800	17,600
Total	177,120	133,620	63,440	58,460	432,640

TABLE II

Number of Yellow Pine Trees Killed During 1922 By Pine Beetles

Unit	Owner				
	Modoc National Forest	Red River Lbr.Co. (T.S.Walker)	Pickering Land & Timber Co.	Other Private Owners	Total
Badger	3,370	505	2,580	680	7,135
Pitt River	2,605	205	795	400	4,005
Happy Camp	1,155	4,525	445	290	6,425
Timber Mtn.	1,285	70	25	55	1,435
Glass Mtn.	990	2,665	4,420	255	8,330
Lava	2,700	195	0	5	2,900
White Horse	250	2,275	0	110	2,635
Widow Valley	110	1,020	0	615	1,745
Hot Springs	770	550	0	1,090	2,410
Buck Valley	0	110	0	870	980
Totals	13,235	12,130	8,565	4,370	38,000

TABLE III

Volume of Yellow Pine Killed By Pine Beetles During 1922

Unit	Owner				
	Modoc National Forest Bd.ft.	Red River Lbr.Co (T.B.Walker) Bd.ft.	Pickering Land & Timber Co. Bd.ft.	Other Private Owners Bd.ft.	Total Bd.ft.
Badger	3,033,000	454,500	2,322,000	612,000	6,421,500
Pitt River	2,844,500	184,500	715,500	360,000	3,604,500
Happy Camp	1,270,500	4,988,500	489,500	319,000	7,067,500
Timber Mtn.	1,150,500	63,000	22,500	49,500	1,291,500
Glass Mtn.	990,000	2,665,000	4,420,000	255,000	8,330,000
Lava	2,470,000	175,500	0	4,500	2,610,000
White Horse	300,000	2,730,000	0	132,000	3,162,000
Widow Valley	110,000	1,020,000	0	615,000	1,745,000
Hot Springs	693,000	495,000	0	981,000	2,169,000
Buck Valley	0	110,000	0	870,000	980,000
Totals	12,327,500	12,886,000	7,969,500	4,198,000	37,381,000

TABLE IV

Control Work Recommended

Units	Principal Owner	% of Ownership				Average No. Trees Per Sec.	Status
		Forest	Walker	Pickering	Others		
Glass Mtn.	Pickering	16	38	42	4	96	Balanced Epidemic
Badger	Forest	50	6	35	9	54	Balanced Epidemic
Happy Camp	Walker	22	67		11	60	Decreasing Epidemic
Pitt River	Forest	71		13	16	57	Increasing Epidemic
White Horse	Walker	10.	83		7	52	Balanced Epidemic
Hot Springs	Others	32	22		46	71	Balanced Epidemic

TABLE V

Control Work Not Recommended

Units	Principal Owner	% of Ownership				Average No. Trees Per Sec.	Status
		Forest	Walker	Pickering	Others		
Timber Mt.	Forest	92			4	29	Balanced Endemic
Lava	Forest	93	7			47	Balanced Endemic
Widow Valley	Walker	5	63		32	32	Balanced Endemic
Muck Valley	Others		10		90	36	Balanced Endemic

TABLE VI

Value of Timber Killed By Beetles in 1922 on Units Recommended For Control-At $3.00 per M.B.M.

Unit	Owner				
	Modoc National Forest	Red River Lbr.Co. (T.B.Walker)	Pioneering Land & Timber Co.	Others	Total
Gloss Mtn.	$2,970	$7,995	$13,260	$765	$24,990
Badger	9,099	1,363	6,966	1,836	19,264
Happy Camp	5,811	14,965	1,468	957	21,201
Pitt River	7,035	853	2,146	1,080	10,812
White Horse	900	8,190	0	396	9,486
Hot Springs	2,079	1,485	0	2,943	6,507
Totals	$ 25,892	$34,551	$23,840	$7,977	$92,260

TABLE VII

Estimated Treatment Required During Fiscal Year 1925

Units	No.Trees	Volume Bd.ft.	Acreage To Be Covered	Man Days	Cost
Glass Mt.	4,165	4,165,000	30,400	3,200	$18,000
Badger	3,565	3,210,000	42,240	2,800	14,450
Happy Camp	3,210	3,533,000	41,600	2,500	15,870
Pitt River	2,000	1,802,000	17,920	1,600	8,120
White Horse	1,320	1,581,000	14,720	1,000	7,130
Hot Springs	1,210	1,084,000	16,560	900	4,880
Totals	15,470	15,375,000	173 ,440	12,000	$69,750

TABLE VIII

Estimated Cost To Owners Involved (of Original Control Work)

Unit	Modoc National Forest	Red River Lbr.Co. (T.B.Walker)	Pickering Land & Timber Co.	Others	Total
Glass Mt.	$2,230	$6,000	$10,000	$370	$18,600
Badger	6,820	1,020	5,250	1,360	14,450
Happy Camp	2,860	11,220	1,100	690	15,870
Pitt River	5,280	420	1,810	810	8,120
White Horse	660	6,150	0	300	7,130
Hot Springs	1,560	1,110	0	2,210	4,880
Totals	$19,400	$25,920	$17,940	$5,900	$69,250

Note:- The above cost is estimated at $4.80 per M.B.M. and inclusive of the original cost of camp equipment, but inclusive of a 33 1/3 % depreciation charged for the equipment furnished by the agency doing the work. The entire area could be charged with four sets of camp equipment costing approximately $600 per camp.

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
HENRY S. GRAVES, FORESTER

MODOC NATIONAL FOREST
CALIFORNIA
MT. DIABLO MERIDIAN
1920

Scale
1 ½ 0 1 2 3 4 5 Miles

NATIONAL FOREST BOUNDARY
ADJACENT NATIONAL FOREST BOUNDARY

30′ 20′ 10′ 121°00′ 50′ 40′

R. 4 E. R. 5 E. R. 6 E. R. 7 E. R. 14 E. 8th. R. 15 E. R. 16 E. Standard R. 17 E. R. 18 E.

T. 48 N. T. 47 N. T. 46 N. T. 45 N. T. 44 N. T. 43 N. T. 42 N. T. 41 N. T. 40 N. T. 39 N. T. 38 N. T. 37 N.

42° 50′ 40° 30′ 20′ 10′ 41°

OREGON CALIFORNIA

MODOC NATIONAL FOREST
KLAMATH LAKE FOREST RESERVE
SHASTA NATIONAL FOREST
SISKIYOU CO. MODOC CO. SHASTA CO. LASSEN CO.

Old Shore Line
Lava Bed
Modoc Lava Bed
Burnt Lava Bed
Tule Lake
Clear Lake Reservoir
Clear Lake Dam
Lost River
East Branch
North Fork
Dry Creek
Rock Cr.
Willow Cr.
Mill Cr.
Wastewater
Tule Lake Sump
Elevation of Water Surface July 8, 1905 = 4056.3′
" " " " June 1, 1917 = 4046.9′
Deepest Pt. of Bed 4031′
B.M. 4067
4576
4523
5750
5533
5400′
6020
7852
6239
6505
7406

Bloody Point
Carrs Ranch
Snake Bed 4035′
Cornell
Bald Mt.
Stone
Scorpion Pt.
Bird I.
Steele
Steele Swamp
Mammoth Springs
Elder Cr. R.S.
Meadow
Baldy (Dog Mt. G.S.)
Becraft Ranch
Heryford Ranch
Yocum
Turner Troughs
Jims Flat Spg.
Homestead Well
Long Mt. Spg.
Fourmile Spg.
Warm Spg.
Weed Valley
Keyes Mt.
Round Willow Spg.
Blue Spr.
Crowder Flat R.S.
Rail Spg.
Coffee Mill Spg.
Mouse Spg.
Janes Flat Res.
Huffman Creek
Tramp Spg.
Bird Spg.
Quaking Asp Spg.
Pot Hole Spring
Pot Hole Valley
Blue Mt. Lookout
Fletcher Cr.
South Spring
Hager Basin
Parallel
Double Head
Dry Pond
Mowitz Cr.
Reservoir
Mowitz Butte
5300 Adj.
Lone Pine Butte
Straw
Ice Cave
10 Miles To Antelope Project
Surveyors Valley
Round Valley
Triangle
Williams Valley
L. and M. Reservoir
Graves Valley
Antelope Plains
Lost Valley
Fairchild Swamp
Mill Spring
Big Sage Flat
Raker and Thomas Reservoir
Goose L. Corral Spg.
Logan Spring R.S.
Ingalls Swamp
Boles Meadow
Boles Cr. R.S.
Ostram Cr. R.S.
Timbered Mt.
Cowhead Spg.
Willow Spring
Pine Spring
Blue Mt. R.S.
Coyote Spg.
Spring
Duncan House Camp
Badger Spg. & Corral
Timber Mt.
Deer Hill
Brown's Well
Hoffman G.S.
Glass Mt.
Payne Spg.
Jaquima Reservoir
Deer Hill R.S.
Hog Ranch
Rail Mt.
Williams Reservoir
Widow Valley
Log House
Bucher Swamp
Jack's Swamp
Dobe Swale
Essex Spg.
Essex Reservoir
Kelley Res.
Cummings Res.
Rock Spg.
L. and M. Well
Rattlesnake
Salisbury Cr.
Spaldings Reservoir
Duncan Reservoir
Mud Lake
Mud Spg.
Buck Butte
Crater
Water Hole
Lava Lake
Round Mt.
Lava R.S.
Sugar Pine Ridge
Hole in Rock
Crank Spg.
Indian Spg.
Mayfield
White Horse Res.
White Horse Valley
Valley Ranch
Little Hot Spg. Valley
Large Spring
Hot Spring Day
Lookout
Clear
Bieber
Dana Falls
Tule Spg.
Riggs
Abandoned Fire Grdn. Cabin
Soldier Mt. Reservoir
Glenburn
McArthur
McArthur (G.S.-Unpub.)
Pittsville
Pittsville (G.S.-Unpub.)
W.A. Vestal
T.H. Vestal
Burton
Hot Spg.
Spring
Saddle (Juniper Tree) (G.S. Unpub.)
Fall River (G.S.)
Fallriver Mills
Snell (G.S. Unpub.)
Muck Valley
B.M. 4146
DAM SITE
Stone Coal Valley
Scheffer Mt.
Canby
Warm Springs Valley
Rattlesnake Butte
Pit River R.S.
Happy Camp Lookout
Grouse Spg.
Casen Spg.
Burner Cr.
Happy Camp R.S.
Dutch Flat R.S.
Rush Cr. R.S.
Graven
Reservoir
Ballard Mill
Tennis Cr.
Essex
Salisbury Spg.
Parallel
Altum Hill G.S.
Pit
Black Canyon
Swales Creek
Metz
Lava R.S.
Water Holes
Trail
Fall Cr.
Pitt River

Badger Unit
Grass Mt. Unit
Timber Mt. Unit
Lava Unit
Happy Camp Unit
White Horse Unit
Widow Valley Unit
Hot Springs Unit
Pitt River Unit
Muck Valley Unit

14 Miles to Sou. Ore.-N. Calif. Project

HAPPY CAMP - LAVA BED PROJECT

LEGEND

Unit Boundaries

Boundary of Sou.Ore.-N.Calif Project

Intensity of Infestation:-

- Annual Loss Averaging 30 or Less Trees Per Section
- " " " 30 to 60 " " "
- " " " 60 to 120 " " "
- " " " 120 or over " " "

October 1923